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This study attempts to design a grant-in-aid scheme incorporating transfer of resources in a manner which compensates for differences in the ability of the subordinate government units to finance desirable service levels (equalization). Results indicate that where the bulk of State aid-to-education funds are distributed through flat grants based on the number of students in a district, a mild redistributive impact is evident. The redistributive effect can be increased markedly by elimination of the flat grant and by distributing all funds on the basis of the ability of each district to support education. It is suggested that consideration of both the school district's ability to pay for its educational needs and the contribution it makes to the State's fund for aid to education would result in an equalizing formula that could more widely distribute the burden of financing a State aid-to-education program. The approach need not be limited to State aid to education as it is capable of general application to intergovernmental grants where redistribution is an important feature. (TT)

ALTERNATIVE MEASURES OF FISCAL REDISTRIBUTION: GROSS VS. NET AID

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Introduction

Intergovernmental grants-in-aid are a long standing feature of our federal system of government. Many such programs contribute to the support of public services at the state and local government levels. While some of these financial transfers provide flat grants related to the cost of the services they support, many of them are variable grants with some element of equalization included in the aid formula. Equalization in this context refers to the intergovernmental transfer of resources in a manner which compensates for differences in the ability of the subordinate government units to finance desirable service levels.

This paper addresses itself to the problem of designing a grant-in-aid scheme which explicitly incorporates equalization as its goal. We use education as our specific program and the State of Missouri as our laboratory. Much of the theoretical groundwork in this area was firmly laid in an article by Richard Musgrave.[1] Basically, we shall use a Musgravian type model modified for our purposes to examine a grant-in-aid program for education in the State of Missouri.

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[1]Richard A. Musgrave, "Approaches to a Fiscal Theory of Political Federalism," in National Bureau of Economic Research, Public Finances: Needs, Sources, and Utilization (Princeton: Princeton University Press, 1961), pp. 97-133.

We are specifically concerned with a program which equalizes fiscal capacity while taking account of individual school districts' need and tax effort.

Previous work on equalization, especially in the field of state aid to education, focused on the effects of the total amount of state aid received by each school district and asked to what extent the aid compensated for differences in fiscal capacity.[2] One of the important contributions of the present technique lies in pointing out the importance of considering the tax payments made by the people in local school districts for the support of the state program of aid to education. Consideration of the tax payments made by the people in the local districts to the state is important because it permits an analysis of net aid patterns (grants-in-aid less tax payments to support the program) which are more meaningful than gross aid patterns for purposes of analyzing the total impact of grant-in-aid programs on equalization. In this paper we compare the present system of state aid to education, both before and after tax payments to the state are subtracted from the aid allocations (gross and net aid patterns), with the pattern of aid that results from the application of a formula incorporating both school district needs and its tax effort and fiscal capacity.

The Musgravian Model

In its ideal form, state aid to local school districts would be distributed by taking account of both the need to provide educational

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[2]This is the approach originally suggested by George Strayer and Robert Haig in their influential book, The Financing of Education in the State of New York (New York: The Macmillan Company, 1923). Since that time Strayer-Haig plans for aid to education have been implemented in a great many of the states.

and the effort which the local unit makes to supply these needs from its own resources in addition to the capacity of the local unit to do so. Musgrave developed a model which includes all of these considerations. The formula employed specifies the amount of aid received by each school district once its tax payments to the state are known.

In this model state aid to local school districts may be either positive or negative depending on the relative size of the several parameters. The basic equation[3] for the model is:

$$S_i = (\bar{B} - B_i)t_i + (N_i/\bar{N}-1)\bar{B}t_i - B_i t_c$$

where S_i = the net aid or tax paid by each school district

B_i = the tax base in each local district; $\bar{B}$ is the average tax base in the state

N_i = the need of each governmental unit; $\bar{N}$ is the average need

t_i = the tax rate in each district

t_c = the central tax rate needed to obtain the funds for the aid program

Only one tax base was assumed to exist and the central tax rate (t_c) could be determined with the addition of one constraint:

$$\Sigma S_i = 0$$

This budget clearing requirement allows t_c to be specified once the other parameters (B_i, N_i, t_i) are known.

Musgrave found that this allocation formula provides an incentive for small-base (poor), high need (large enrollment) districts to raise their expenditures by increasing their local taxes because this would

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[3]Adapted from op. cit., p. 109.

proportionately increase state aid to education in these districts (the sign of $\partial S_i/\partial t_i$ is positive). In large base (wealthy), low need (small) districts a disincentive effect would result in a tendency towards reducing local tax rates. His analysis further suggests that if tax rates are higher in the former type of districts, there is likely to be some redistribution towards these districts.[4]

Methodology and Data Sources

In the modified formula used to distribute aid two tax bases, one for the local school districts and another for the state, were employed since the sources of revenue are different in the two cases. The taxing capacity of local school districts is primarily dependent upon the property tax base while the state's sources of tax revenue are quite diverse including both an income and a sales tax. In this study counties were selected as the unit for examination since this was the smallest governmental unit for which data on the sources of state tax revenues were available. School districts were combined into equivalent county units for comparability.[5] The measure of need is the average number of children in attendance at schools during 1964-65 in grades 1 through 12.[6]

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[4]Musgrave, op. cit., pp. 110-111.

[5]The county unit will be referred to as the district in the remainder of the paper. We recognize, however, that there are considerable differences in assessed property values per student among school districts within the counties of Missouri. These differences which if overlooked in actual implementation of aid formulas, could cause gross inequities.

[6]We recognize that measures of need based on attendance neglect considerations of costs differentials which exist. Obviously, the production function for education differs among school districts within

The actual system of state aid to education in Missouri in 1964-65 which will be compared to the proposed system just described has both flat and equalizing grants. A previous study showed that the Missouri system of gross aid (before considering tax payments) was considerably less equalizing than those in the neighboring states of Kentucky and Tennessee because of the large proportion (67%) of the funds which are distributed on a flat grant basis in Missouri.[7] In the present study both the gross and net (after tax payments) aid were calculated and compared with the corresponding figures under the modified Musgravian system.

To calculate the contribution of each county to the state treasury we assumed that all tax collections impose a burden on the residents of the county in which they are collected; those collections which were paid directly by out-of-state taxpayers were assumed to impose no burden on Missouri residents.[8] The major taxes, sales and income, were allocated directly on the basis of collections data.[9] Cigarette and liquor taxes

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a state. We might expect the urban districts to use a different combination of resources than the rural districts to produce the same quality of education; this may require different per pupil expenditures in the two types of school systems.

[7]For further details on the actual program in Missouri and these comparisons see David Barkin, "State Aid and the Equalization of the Burden of Educational Costs" in Problems in Urban Educational Planning, Technical Reports Series No. 2, Central Midwestern Regional Educational Laboratory, St. Louis, Missouri, March 1967, pp. 7-37.

[8]In effect we have assumed that on a spatial basis tax impact and tax incidence are the same. We recognize, however, that this procedure overstates the tax burden of points of distribution of goods, notably the cities.

[9]The data on tax collections by county were kindly provided by Mr. Thomas David, Director, Department of Revenue, State of Missouri.

are collected from distributors and these revenues were allocated among the counties on the basis of the distribution of the population. Motor vehicle use taxes were not included in the calculations because they are all specifically earmarked for highway uses and cannot be diverted to other purposes. Some small amounts of tax revenues which were not directly allocable to any one county were distributed in the same proportions as all other tax collections.

A least squares line was fit to the data to estimate the relationship between gross aid and net aid per pupil (as dependent variables) and equalized assessed property values per student in each county. The slopes of the lines thus obtained (Figures 1 and 2) were compared to determine the effects of introducing net figures into the analysis.

The data were also displayed graphically with Lorenz curves (Figure 3) to clearly present the effects of the two aid programs on the distribution of state aid funds to school districts of differing ability to support education.

Analysis and Results

The relationships between gross and net aid and equalized assessed property values, all measured in dollars per student, under the existing program and the equalizing plan as estimated by least squares lines fitted to the data are graphically shown in figures 1 and 2. Both plans require the same appropriation for state aid. The level of aid in terms of dollars per student is plotted along the vertical axis and assessed value per student is measured along the horizontal axis. The graph is drawn for the relevant range of values which range from a low of $5,657

of equalized assessed value per student to a high of $49,488 of assessed value per student.

Under both the existing program of aid and the equalizing program gross aid per student declines as assessed value per student increases, as is clear from an examination of Figure 1. Thus both programs tend to be equalizing to some extent. The slope of the line is an indication of the degree of equalization. The specially designed equalizing program is clearly more equalizing than the existing program. The poorer districts (in terms of assessed value per student) receive substantially more aid per student under the equalizing program than under the existing program. A district with $34,166 of assessed value per student would receive the same level of aid under either program. Districts with greater assessed value per student than $34,166 would receive less aid per student under the equalizing plan than under the existing program.[10] Under the existing program all districts receive some positive amount of aid from the state. Under the equalizing plan the wealthier districts would receive no aid from the state.

While the analysis of the gross aid patterns is revealing and interesting, it does not shed much light on the total redistributive

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[10]The equalizing plan admits the possibility of negative gross aid which would necessitate a payment to the aid fund. Practically this is not a real possibility and in practice a constraint in the aid formula specifying that aid must be equal or greater than zero would have to be included. The actual budget for state aid to education is a constraint in the present analysis. If no increase in appropriation is available, the adjustment to eliminate the possibility of gross aid being negative would slightly reduce the level of aid under the equalizing plan for districts with low equalized assessed property value per student. It should be noted, however, that the total amount of aggregate negative net aid was practically insignificant.

Figure 1

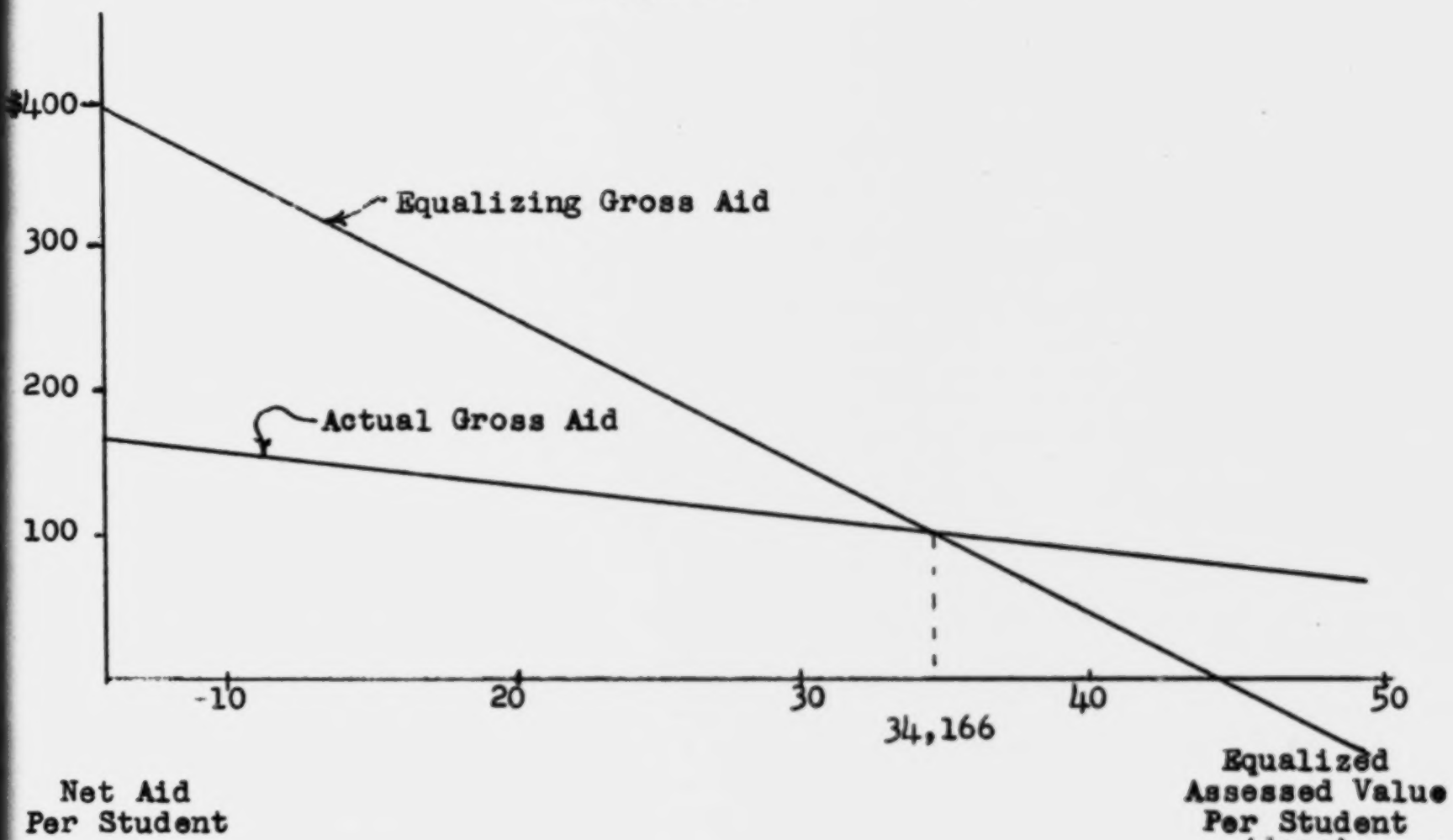
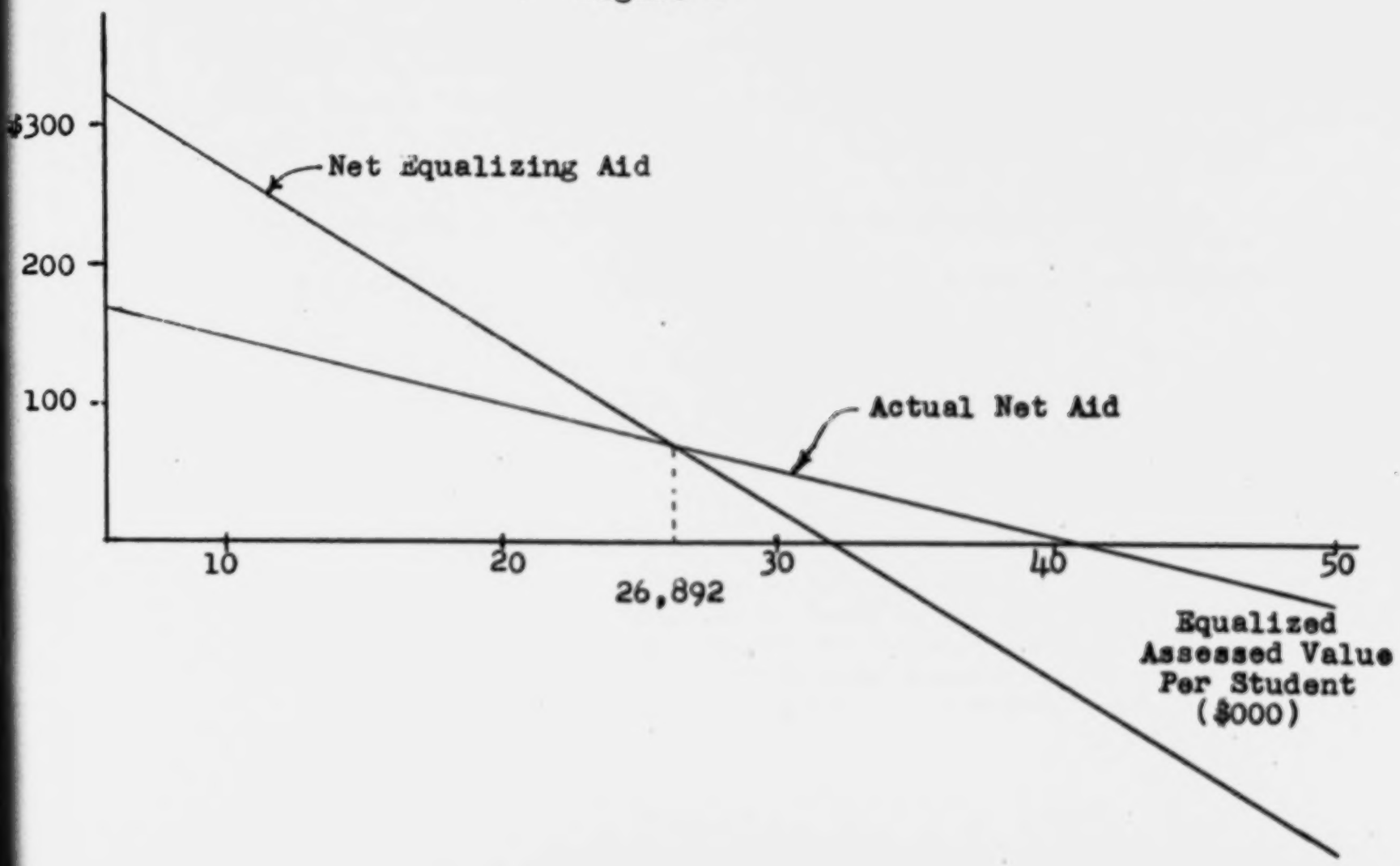


Figure 2



impact of the aid program. Aid programs redistribute funds from one district to another. If they did not redistribute funds, then the state would simply be a collector and distributor of locally generated tax revenues. Although we acknowledge the state's redistributive role, gross aid patterns do not tell us the full extent of the redistribution. For this we must examine net aid patterns. The relationship between net aid and equalized assessed property value per student under the existing program and the proposed equalizing plan are exhibited in Figure 2.

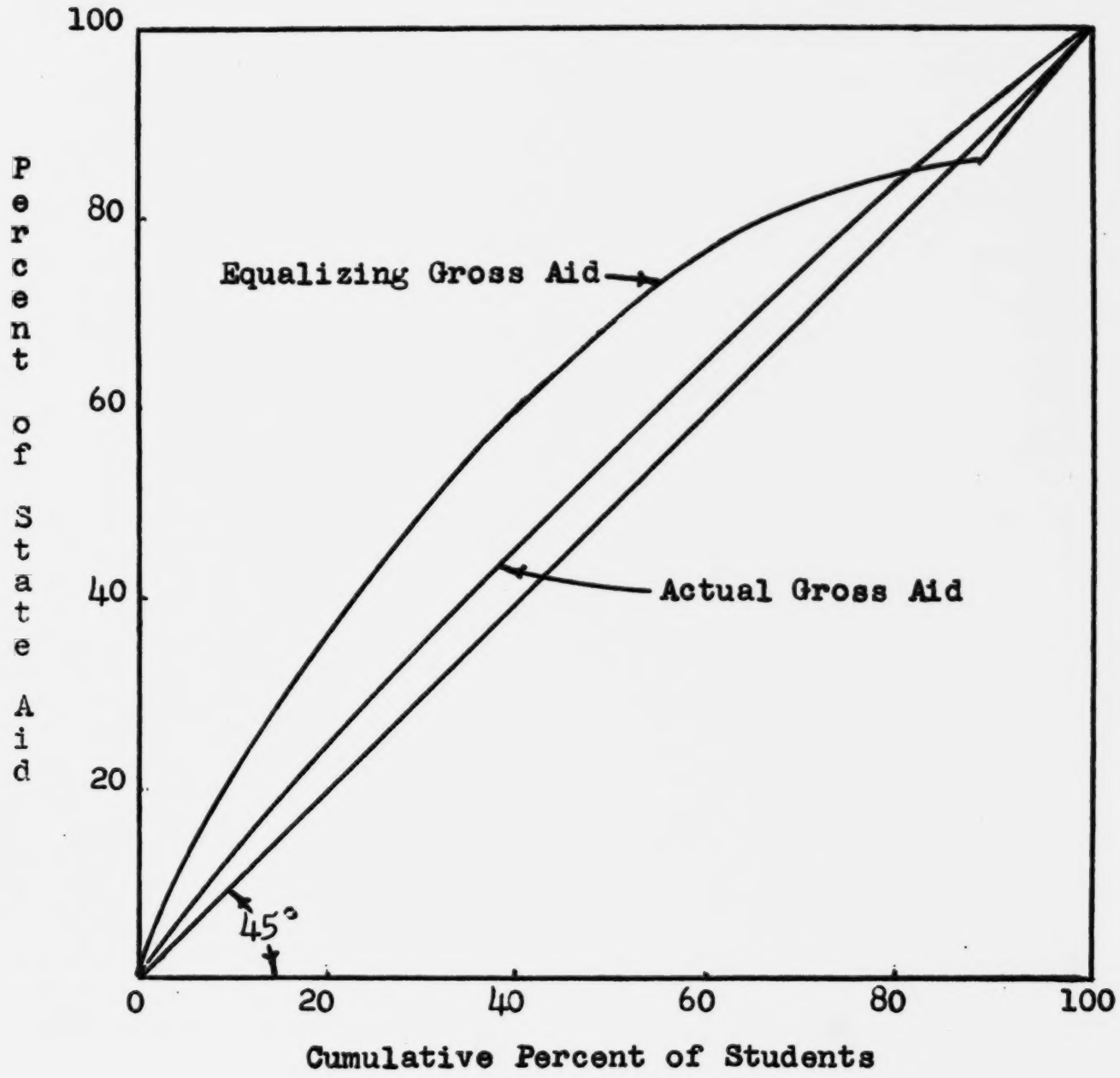
Under both plans funds are redistributed from the wealthy (large base) districts to the poorer (small base) districts. Under the proposed equalizing plan, however, the poorer districts receive substantially more net aid per student than under the existing program. As in the case of the gross aid analysis, the slopes of the lines allow us to draw certain inferences. Under the equalizing plan not only do the poorer districts receive more aid per student, but this is accomplished without necessitating an increase in the size of the state's educational aid budget. What does occur is the reduction in the level of equalized assessed value per student at which net aid becomes negative from $41,295 to $32,045. Thus the extent of the redistribution is increased with a larger proportion of the wealthier districts sharing the responsibility for the redistribution and the richest districts will have their levels of negative net aid substantially increased. Those districts with equalized assessed value per student lying between $32,045 and $41,295 which under the existing program received modest

amounts of positive net aid would contribute to the net aid of the smaller base districts.

The figures used for the least squares analysis were in per student terms. Thus we are justified in calling the high base districts the wealthy districts. Alternatively, we may be interested in the patterns of aid with respect to aggregate amounts of aid rather than per capita amounts of aid. For example, we may wish to know the proportion of aid going to the poorer districts. Formulas expressing aid in per student terms must be converted into aggregate amounts by multiplying by the number of students enrolled in each district. The technique used to analyze the impact of the alternative aid programs in aggregate terms employs modified Lorenz curves. Along the horizontal axis we plot the cumulative percent of students in each district in the state ranking the districts from low to high by assessed value per student. On the vertical axis we plot the amount of state aid to each district as a cumulative percentage of total state aid. A perfectly equal distribution of aid (that is the districts with 10, 20, 30, etc. percent of the students receiving 10, 20, 30, etc. percent of the state aid) would trace out a 45 degree line from the origin.

We define an aid program which results in a Lorenz curve lying above the 45 degree line (the poorer districts receiving proportionately more aid with respect to student enrollments than the wealthy districts) as progressive. A formula which results in a distribution of aid such that the Lorenz curve lies below the 45 degree line is defined as regressive. The further the curve lies from the 45 degree line the greater is the extent of progressivity or regressivity.

Figure 3


100
80
60
40
20
0
20
40
60
80
100
Percent of State Aid
Equalizing Gross Aid
Actual Gross Aid
45°
Cumulative Percent of Students

Both the present grant-in-aid program and the equalizing progam distributes a greater proportion of funds to the poorer districts than the proportion of children going to school in these districts. The equalizing program is significantly more progressive as may be noted from Figure 3. For example, the poorest districts, when measured by equalized assessed value per student, with a cumulative student enrollment of 10 percent of the state's total enrollments would qualify for nearly 22 percent of the gross state aid under the equalizing program instead of 13 percent they presently receive. The districts with roughly half the students in the state receive approximately 56 percent of the aid under the present plan and would receive nearly 70 percent under the equalizing plan.

The equalizing plan becomes regressive at high levels of equalized assessed value. What this effectively means is that those districts with high assessed valuation per student receive a less than proportional share of state aid.

An analysis of the data summarized in Figures 2 and 3 shows that with the present program districts with only one-eighth of the students finance the net aid program for the rest of the school districts in the state. Since, on balance, the net aid from the program (tax payments minus grants-in-aid) must be zero and most districts receive back from the state all of the funds they contribute for state aid to education, there is only a small residual which is actually transferred from the wealthier districts to the poorer ones. Of the nearly $121 million distributed in state aid to education during the 1964-65 school year

only $29 million, or 24 percent, was shifted from one district to another.

If the equalizing program were enacted there would be a dramatic change that would require people in the districts with roughly one-half of the students from the wealthiest parts of the state to finance all of the costs of the state aid to education program for the others. With this alternative a much larger amount of money, $43 million or 36 percent of the total aid program, is transferred to a smaller number of districts and children. The resources available for each student in the poorer districts would more nearly approximate those in the others. This change in the distributive impact could be accomplished without an increase in the total state appropriation for aid to education.

Conclusions

In those states where the bulk of the state aid to education funds are distributed through flat grants based on the number of students in a district a mild redistributive impact is evident. It would be possible to increase the redistributive effect of this program markedly by eliminating the flat grant for each student and distributing all funds on the basis of the ability of the district to support education, as suggested by Strayer and Haig years ago. An aid program based on gross payments from the state to local districts would take account of the number of school children in a district as well as its ability to pay for the costs of providing education.

In this paper we suggested consideration of both the ability of a school district to pay for its educational needs and the contribution

it makes to the state's fund for aid to education. A change from the present flat grant program to this type of equalizing formula would distribute the burden of financing the state aid to education program in Missouri more widely. It would also highlight the actual degree of redistribution by focusing on the net aid which each school district receives. The data summarized above reveal that 50 percent more money would be distributed among districts to 45 percent fewer children by adopting the alternative formula without any increase in state appropriations. Since this approach need not be limited to state aid to education, it may be a very useful tool for examining intergovernmental grants where redistribution is becoming an increasingly important feature.